Humboldt, Cal., in 1887; 120 at Fort Mojave, Ariz., in 1889; 119 at Fort Miller, Cal., in 1853, and at El Dorado Canyon, Nev., in 1889; 115 at Saint George, Utah, in 1889; and 114 at Gibson, Kans., in 1889.

The lowest temperatures reported by regular stations of the Signal Service were: 36 at Tatoosh Island, Wash., 20th; 37 at Baker City Oregon, 10th, and at Fort Washakie, Wyo., 11th; and 38 at Northfield, Vt., 21st. The minimum temperature was below 50 north of a line traced from the Maine coast southwestward to south-central Pa., thence northward to western N. Y., thence irregularly westward to eastern Wyo., thence southward to central N. Mex., thence northwestward to northern Utah, thence south of west to east-central Cal., thence northward to northern Cal., and thence southward, inside the coast line, to San Francisco, Cal. The minimum temperature was highest, 74, at Yuma, Ariz., and was 70, or above, at Jupiter, Fla., Galveston, Corpus Christi, and Rio Grande City, Tex. The reports of United States Army post surgeons and state weather service and voluntary observers show the following minimum temperatures in states and territories where temperature falling below 40 was reported: Breckenridge, Colo., 26; Soda Springs, Idaho, 27; Elko (2), Nev., 28; Berlin Mills, N. H., Bangor, Me., and Virginia City, Mont., 30; Happy Valley and Beulah, Oregon, 31; Huntingdon, Pa., and Boca, Cal., 33; Number Four, N. Y., 34; Waterville, Wash., and Coolidge, N. Mex., 35; Aberdeen, S. Dak., 36; Orangeville, Ohio, Lake Cochituate, Mass., and Fort Bridger, Wyo., 37; Oceanic, N. J., Christiansburgh, Va., and several stations in N. Dak., 38; and Greenwood, Wis., 39.

At the following named stations of the Signal Service the minimum temperature for the current month was as low or lower than previously reported for July: New Haven, Conn., 18 years record, 49, 1 below minimum of 1885; Albany, N. Y., 17 years record, 48, the same as 1876; Philadelphia, Pa., 20 years record, 54, 2 below 1883; Atlantic City, N. J., 17 years record, 52, 1 below 1880; Baltimore, Md., 20 years record, 55, 1 below 1885; Washington City, 20 years record, 53, 1 below 1885; Lynchburgh, Va., 20 years record, 54, the same as 1885; Southport, N. C., 15 years record, 58, 2 below 1885; Wilmington, N. C., 20 years record, 58, 2 below 1888; Jacksonville, Fla., 19 years record, 66, 2 below 2 or more years; New Orleans, La., 20 years record, 68, 2 below 1882; Fort Smith, Ark., 9 years record, 58, 2 below 1889; Columbus, Ohio, 13 years record, 50, 1 below 1885; Rochester, N. Y., 19 years record, 47, the same as 1886; and Cleveland, Ohio, 20 years record, 50, 2 below 2 or more years.

RANGES OF TEMPERATURE.

The greatest and least daily ranges of temperature at regular stations of the Signal Service are given in the table of miscellaneous meteorological data. The greatest monthly ranges of temperature occurred in the northern plateau region, where they exceeded 60, whence they decreased westward to less than 20 on the immediate Pacific coast, southward to less than 40 over the southeast part of the plateau region, southeastward to less than 30 on the Gulf and south Atlantic coasts, and eastward to less than 40 over the southern part of the upper lake region; from the Lake region the monthly ranges increased to more than 50 in northwest New England, whence they decreased to less than 30 on the southeast coast of New England.

FROST.

On the 20th light frost was reported in Litchfield Co., Conn., which caused some damage to tender plants in low ground. On the 21st light frost occurred in Onondaga and Delaware counties, N. Y., and in Baltimore Co., Md. On the 20th and 21st light frost occurred generally in northern Ohio, and on the 21st heavy frost was reported at Youngstown, Ohio, and a few miles north of that place considerable damage was caused to corn and potatoes. On the 22d light frost was noted at Oakland, Md. No frost was reported in the central valleys. In the plateau region light frost occurred near Great Salt Lake, Utah, on the 10th and 11th, and at Carson City, Nev., on the 11th, 30th, and 31st. Light frost was noted in southwest Montana on the 31st. On the Pacific coast light frost was reported in northwest Oregon on the 10th.

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature as observed at the harbors of the several stations; the monthly range of water temperature; and the mean temperature of the air for July, 1890:

Stations.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
	°	°	°	°	°
Boston, Mass	69.0	61.7	7.3	65.5	71.0
Canby, Fort, Wash	64.9	62.4	2.5	63.9	57.8
Charleston, S. C	87.5	80.0	7.5	83.8	79.8
Eastport, Me	52.0	46.8	5.2	49.3	60.8
Galveston, Tex	88.0	83.5	4.5	85.7	82.7
Key West, Fla	88.8	84.0	4.8	87.0	82.2
Portland, Oregon	71.0	64.5	6.5	68.0	65.5

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for July, 1890, as determined from the reports of nearly 2,000 stations, is exhibited on chart iii. In the table of miscellaneous meteorological data the total precipitation and the departure from the normal are given for each Signal Service station. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

The heaviest precipitation reported was 19.21, at Manatee, Fla.; the monthly precipitation exceeded 10.00 in areas in the south Atlantic and east Gulf states, at Marengo, Ind., and in the Chiri Cahua Mountains, Ariz. Over a greater part of California and at a number of stations in the west part of the plateau region south of the 45th parallel no precipitation was reported, and over the northern and middle plateau regions and on the eastern slope of the Rocky Mountains the rainfall for the month was generally less than 1.00.

The precipitation was in excess of the July average in the south Atlantic and east Gulf states, the lower Rio Grande valley, the east part of the southern plateau region, within an area extending from southeast Wyo. over north Nebr. and south South Dakota, on the immediate north Pacific coast, and at Canadian stations from Manitoba to Quebec; elsewhere it was deficient. The greatest excess occurred on the east Gulf coast, where, at Pensacola, Fla., 11 years record, it was more than 7.00, and on the S. C. coast, where it was more than 5.00 at Charleston. The greatest deficiency occurred from the Ohio Valley westward over Kans., in the north part of the upper Mississippi valley, and in northeast S. Dak., where it exceeded 3.00.

At the following-named places the precipitation for the current month was the heaviest reported for July: Southport, N. C., Statesburgh, S. C., and Pensacola, Fla.; and at the following-named places it was the least on record for July: Grampian Hills and Wellsborough, Pa., Nashville, Tenn., Lexington, Ky., Riley, Ill., Erie, Pa., Cresco, Iowa, Bismarck, N. Dak., La Crosse, Wis., Saint Louis, Mo., Fort Sully and Huron, S. Dak., Wellington, Kans., Fort Custer, Mont., North Platte, Nebr., Concordia and Dodge City, Kans. At Red Bluff, Los

Angeles, Sacramento, and San Diego, Cal., no precipitation occurred, and no precipitation was reported for July of several preceding years.

Considered by districts the average percentage of the normal in districts where the precipitation was in excess for July, 1890, was about as follows: lower Rio Grande valley, 145 per cent.; south Atlantic states, 136 per cent.; east Gulf states, 133 per cent.; north Pacific coast, 113 per cent.; and southern plateau region, 106 per cent. In districts where the precipitation was deficient the percentage of the normal was about as follows: middle-eastern slope of the Rocky Mountains, 26 per cent.; upper Mississippi valley, 39 per cent.; northern plateau region, 42 per cent.; middle plateau region, 45 per cent.; lower lake region, 51 per cent.; Ohio Valley and Tennessee, 52 per cent.; northeast slope of the Rocky Mountains, 56 per cent.; west Gulf states, 57 per cent.; Missouri Valley and extreme northwest, 67 per cent.; upper lake region and southeast slope of the Rocky Mountains, 75 per cent.; New England, 77 per cent.; Key West, Fla., 86 per cent.; middle Atlantic states, 97 per cent.; south Pacific coast, no rain fell, normal about 0.02; middle Pacific coast, precipitation about normal.

For the period January to July, 1890, inclusive, the precipitation on the middle Pacific coast averaged about $\frac{1}{3}$ greater, and in the west Gulf states, the Ohio Valley and Tennessee, and the lower lake region $\frac{1}{10}$ to $\frac{2}{10}$ greater than the average, while in the south Atlantic and east Gulf states, at Key West, Fla., in the Missouri Valley, on the northeast and middle-eastern slopes of the Rocky Mountains, in the middle plateau region, and on the south Pacific coast it averaged about $\frac{3}{4}$ of the normal amount for the period named.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for July for a series of years; (2) the length of record during which the observations have been taken and from which the average has been computed; (3) the total precipitation for July, 1890; (4) the departure of the current month from the average; (5) and the extremes for July during the period of observation and the years of occurrence:

State and station.	County.	(1) Average for the month of July.	(2) Length of record.	(3) Total for July, 1890.	(4) Departure from average.	(5) Extremes for July. Greatest. Am't.	Greatest. Year.	Least. Am't.	Least. Year.
Arkansas.		*Inches*	*Years*	*Inches*	*Inches.*	*Inches*		*Inches.*	
Lead Hill	Boone	5.63	8	1.84	−3.79	11.60	1883	1.15	1888
California.									
Sacramento	Sacramento	0.02	40	0.00	−0.02	0.55	1860	0.00	*
Connecticut.									
Middletown	Middlesex	4.52	28	4.16	−0.36	13.43	1889	1.54	1870
Florida.									
Merritt's Island	Brevard	6.03	12	9.34	+3.31	11.72	1884	0.86	1883
Georgia.									
Forsyth	Monroe	4.51	16	5.35	+0.84	12.70	1887	0.32	1878
Illinois.									
Peoria	Peoria	4.07	34	0.72	−3.35	8.87	1860	0.47	1886
Riley	McHenry	3.85	39	0.53	−3.32	9.99	1862	0.53	1890
Indiana.									
Logansport	Cass	3.25	15	2.43	−0.82	7.52	1889	0.62	1856
Vevay	Switzerland	4.07	25	5.61	+1.54	9.80	1874	0.90	1869
Iowa.									
Cresco	Howard	4.51	17	1.32	−3.19	12.70	1883	1.32	1890
Monticello	Jones	4.40	35	1.79	−2.61	10.93	1883	0.60	1874
Logan	Harrison	5.49	24	2.29	−3.20	13.00	1878	2.20	1886
Kansas.									
Lawrence	Douglas	4.45	25	1.56	−2.89	7.85	1861	0.11	1886
Wellington	Sumner	4.36	11	0.46	−3.90	7.99	1889	0.46	1890
Louisiana.									
Grand Coteau ‡	St. Landry	4.42	7	.....	.....	.....	.....	.....	.....
Maine.									
Orono	Penobscot	3.44	20	3.84	+0.40	7.11	1887	1.05	1886
Maryland.									
Cumberland	Allegany	3.65	18	1.67	−1.98	5.59	1887	1.01	1885
Massachusetts.									
Amherst	Hampshire	4.58	54	5.56	−0.98	11.58	1874	0.96	1864
Newburyport	Essex	3.97	12	2.90	−1.07	6.90	1883	1.43	1882
Somerset	Bristol	3.88	18	3.26	−0.62	7.52	1880	2.04	1886
Michigan.									
Kalamazoo	Kalamazoo	3.64	14	1.14	−2.50	6.50	1877	0.79	1887
Thornville	Lapeer	3.16	13	1.10	−2.06	6.69	1883	0.47	1881
Minnesota.									
Minneapolis	Hennepin	3.08	24	1.90	−1.18	6.26	1879	0.43	1877
Montana.									
Fort Shaw	LewisaClarke	1.04	20	0.70	−0.34	2.66	1884	0.00	'71,'74
New Hampshire.									
Hanover	Grafton	3.47	44	3.85	+0.38	8.48	1877	1.24	1854
New Jersey.									
Moorestown	Burlington	4.32	27	4.00	−0.32	7.94	1889	1.40	1882
South Orange	Essex	5.33	19	5.74	+0.41	18.58	1889	1.03	1881
New York.									
Cooperstown	Otsego	4.18	36	3.39	−0.79	7.92	1863	0.89	1868
Palermo	Oswego	3.27	36	3.68	+0.41	6.60	1874	0.64	1882
North Carolina.									
Lenoir	Caldwell	4.76	17	7.20	+2.44	9.10	1886	1.70	1884
Ohio.									
N. Lewisburgh	Champaign	4.96	18	0.30	−4.66	8.60	1876	0.30	1890
Wauseon	Fulton	3.86	18	0.48	−3.38	7.26	1872	0.31	1886
Oregon.									
Albany	Linn	0.55	13	0.38	−0.17	1.87	1884	0.00	*
Eola	Polk	0.48	18	0.05	−0.43	2.29	1884	0.00	*
Pennsylvania.									
Dyberry	Wayne	4.82	19	4.45	−0.37	9.28	1887	0.00	1868
Grampian Hills	Clearfield	5.11	19	3.24	−1.87	7.33	1889	3.24	1890
Wellsborough	Tioga	6.82	11	2.65	−4.17	12.30	1880	2.65	1890
South Carolina.									
Statesburgh	Sumter	3.93	9	8.34	+4.41	8.34	1890	1.70	1864
Tennessee.									
Austin	Wilson	4.19	22	0.26	−3.93	10.13	1880	0.20	1881
Texas.									
New Ulm	Austin	3.98	18	1.17	−2.81	14.38	1873	0.00	1884
Vermont.									
Strafford	Orange	4.63	17	4.00	−0.63	6.77	1873	2.00	1881
Virginia.									
Birdsnest	Northampton	4.27	21	3.55	−0.72	8.90	1877	1.25	1873
Washington.									
Fort Townsend	Jefferson	0.84	15	1.01	+0.17	4.41	1888	0.01	1889
Wisconsin.									
Madison	Dane	4.44	21	1.81	−2.63	9.47	1881	0.79	1886

*Generally. ‡Not received.

EXCESSIVE PRECIPITATION.

Monthly precipitation to equal or exceed 10 was reported at 6 stations in Fla.; at 4 stations in Ga.; at 3 stations in Miss.; at 2 stations in N. C.; and at 1 station in Ala., Ind., La., S. C., and Va.; the greatest, 19.21, being reported at Manatee, Fla.

In July of preceding years monthly precipitation to equal or exceed 10 has been reported for 32 years in Fla.; for 20 years in Ga.; for 18 years in S. C.; for 16 years in N. Y.; for 14 years in Kans.; for 13 years in N. H. and N. C.; for 12 years in Iowa, La., and Mo.; for 11 years in Ala.; for 5 to 10 years in Ark., Ill., Ind., Mass., Mich., Minn., Miss., Nebr., N. J., Ohio, Pa., Tenn., Tex., Va., and Wis.; and for 1 to 4 years in Ariz., Colo., Conn., the Dakotas, Del., D. C., Ind. T., Ky., Md., N. Mex., R. I., Vt., and W. Va. In states and territories other than those named precipitation to equal or exceed 10 has not been reported for July of preceding years. The following are notably heavy rainfalls reported for July of preceding years: 28.11 at White, Tenn., in 1883; 25.88 at Fernandina, Fla., in 1864; 24.52 at Fort Brooke, Fla., in 1840; 23.90 at Mount Washington, N. H., in 1884; 22.24 at Fort Brooke, Fla., in 1856; 21.86 at Lake Hook, Minn., in 1872; 21.31 at Fort Brooke, Fla., in 1848; 21.12 at Wilmington, N. C., in 1886; 21.09 at Auburn, Ala., in 1887; 20.50 at Kentland, Ind., in 1869; 20.45 at Diamond, Ga., in 1889; 20.43 at Savannah, Ga., in 1847; and 20.18 at Opelika, Ala., in 1887.

Precipitation to equal or exceed 2.50 in 24 hours was reported at 15 stations in Ga., and on 10 dates, the 3d, 7th, 17th, 20th, 21st, 23d to 26th, and 28th; at 10 stations in Tenn., and on 4 dates, the 13th, 14th, 23d, and 24th; at 9 stations in Fla., and on 8 dates, the 4th, 10th, 20th to 23d, 25th, and 26th; at 9 stations in Nebr., and on 3 dates, the 18th to 20th; at 7 stations in N. Y., and on 5 dates, the 1st to 3d, 25–26th; at 5 stations in La., and on 5 dates, the 23d to 27th; at 5 stations in Mass., and on 3 dates, the 25th, 26th, and 29th; at 5 stations in Miss., and on 7 dates, the 2d, 13th, 20th, 22d to 24th, and 26th; at 5 stations in Mo., and on 5 dates, the 15th, 18th, 20th, 21st, and 23d; at 4 stations in Ala., on the 24th; at 4 stations in Conn., and on 2 dates, the 17th and 25th; at 4 stations in Kans., and on 5 dates, the 3d, 14th, 15–16th, and 22d;

at 4 stations in N. C., and on 6 dates, the 16th, 18–19th, 24th, 28th, and 29th; at 4 stations in S. C., and on 3 dates, the 24th, 27th, and 28th; at 4 stations in Tex., and on 4 dates, the 3d, 4th, 25th, and 26th; at 3 stations in Ill., and on 3 dates, the 14th, 15th, and 31st; at 3 stations in Ind., on the 23d; at 3 stations in Ky., and on 2 dates, the 14th and 23d; at 3 stations in W. Va., and on 3 dates, the 1st, 2d, and 16th; at 2 stations in Iowa, and on 2 dates, the 12th and 19th; at 2 stations in Mich., and on 4 dates, the 7–8th, and 22–23d; at 2 stations in Va., and on 2 dates, the 28th and 29th; at 1 station in N. H., on the 25–26th; at 1 station in N. J. on the 28th; at 1 station in N. Dak. on the 14th; at 1 station in S. Dak. on the 24th; at 1 station in Ohio on the 1st; at 1 station in Pa. on the 15th; and at 1 station in Vt. on the 2–3d. Among the heavier rainfalls reported for this period are: 8.26 at Fort Barrancas, Fla., 22–23d; 7.50 at Saint Francis Barracks, Fla., 22–23d; 7.00 at Marengo, Ind., 23d; 6.64 at Manatee, Fla., 4th; 6.34 at Cheboygan, Mich., 7–8th; 6.10 at Grand Junction, Tenn., 13–14th; 6.07 at Charleston, S. C., 27–28th; 5.91 at Constableville, N. Y., 1st; 5.00 at Charleston, Ill., 31st; 5.00 at Andersonville, Tenn., 13th; 4.25 at Blakely, Ga., 20th; 4.20 at Quitman, Ga., 7th; and 4.00 at Valley Head, Ala., 24th.

In July of preceding years precipitation to equal or exceed 2.50 in 24 hours has been reported for 20 years in Kans.; for 16 years in Iowa; for 15 years in Nebr.; for 14 years in Ind., N. C., and S. C.; for 13 years in Ga., Pa., and Tex.; for 12 years in the Dakotas, Fla., Ill., and Ohio; for 11 years in Mo. and N. J.; for 5 to 10 years in Ala., Conn., D. C., Ind. T., Ky., Md., Mass., Mich., Minn., Miss., N. H., N. Y., Tenn., Va., and Wis.; and for 1 to 4 years in Ariz., Ark., Colo., Del., Me., Mont., N. Mex., Oregon, R. I., Utah., Vt., and W. Va. In states and territories other than those named precipitation to equal or exceed 2.50 in 24 hours has not been reported for July of preceding years.

Among the heavier rainfalls reported for 24 hours in July of preceding years are: 12.00 at Lambertville, N. J., 16th, 1865; 10.00 at Union Point, Ga., 29th, 1887; 8.57 at South Orange, N. J., 30th–31st, 1889; 8.00 at Logan, Iowa, 10th, 1878; 7.75 at Nashua, Iowa, 9th, 1881; 7.61 at Independence, Mo., 14th, 1885; 7.50 at Thomson, Ga., 28th, 1887; 7.50 at Smithville, Ga., 12th, 1884; 7.50 at Fort Ripley, Minn., 18th, 1867; 7.33 at Wilmington, N. C., 15th, 1886; 7.21 at Carthage, Mo., 24th, 1886; 7.00 at Grace, Ohio, 9th, 1888; 7.00 at Hulmeville, Pa., 26th, 1879; 6.00 at Russellville, Ark., 29th, 1889; 5.38 at Manhattan, Kans., 23d, 1889; 5.16 at Rock Island Arsenal, Ill., 13th, 1889; and 5.00 at Fort Clark, Tex., 10th, 1889.

Precipitation to equal or exceed 1.00 in 1 hour was reported at 11 stations in La., and on 9 dates, the 3d, 7th, 8th, 15th, 16th, 18th, 19th, 21st, and 26th; at 7 stations in Ga., and on 8 dates, the 2d, 6th to 8th, 14th, 17th, 18th, and 21st; at 6 stations in Mo., and on 5 dates, the 8th, 9th, 12th, 15th, and 19th; at 6 stations in Ohio, and on 2 dates, the 1st and 24th; at 5 stations in Miss., and on 6 dates, the 7th, 8th, 20th, 23d, 24th, and 31st; at 5 stations in S. C., and on 6 dates, the 4th, 5th, 9th, 16th, 19th, and 21st; at 4 stations in Ariz., and on two dates, the 29th and 30th; at 4 stations in Fla., and on 5 dates, the 3d, 11th, 24th, 26th, and 27th; at 4 stations in Ill., and on 3 dates, the 14th, 23d, and 31st; at 4 stations in Kans., and on 3 dates, the 3d, 14th, and 27th; at 4 stations in N. C., and on 3 dates, the 5th, 10th, and 29th; at 3 stations in Ky., and on 3 dates, the 8th, 15th, and 23d; at 3 stations in N. Mex., and on 3 dates, the 2d, 16th, and 31st; at 3 stations in Pa., and on 2 dates, the 15th and 17th; at 3 stations in Tenn., and on 3 dates, the 2d, 8th, and 14th; at 2 stations in Ark., and on 2 dates, the 7th and 14th; at 2 stations in Nebr., and on 2 dates, the 19th and 20th; at 2 stations in S. Dak., and on 2 dates, the 20th and 21st; at 1 station in Ala. on the 27th; at 1 station in Iowa on the 22d; at 1 station in Me. on the 8th; at 1 station in Mich. on the 14th; at 1 station in Minn. on the 13th; at 1 station in N. J. on the 17th; at 1 station in N. Dak. on the 10th; at 1 station in Utah on the 28th; at 1 station in Va. on the 18th and 24th; at 1 station in W. Va. on the 15th; and at 1 station in Wyo. on the 4th. Among the heavier rainfalls reported for 1 hour or less are: 1.00 in 15 minutes, at Rancocas, N. J., 17th; 1.50 in 20 minutes at McAllaster, Kans., 3d; 1.50 in 20 minutes, at Red Cañon, N. Mex., 31st; 1.25 in 20 minutes, at Vienna, Ohio, 1st; 2.50 in 30 minutes, at Wilkes Barre, Pa., 15th; 2.01 in 30 minutes, at Benton Harbor, Mich., 14th; 1.90 in 33 minutes, at Ash Canyon, Ariz., 30th.

In July of preceding years precipitation to equal or exceed 1.00 in 1 hour has been reported for 17 years in Kans.; for 16 years in Pa.; for 15 years in Iowa; for 13 years in Ill. and N. C.; for 12 years in Ind., Nebr., and Tex.; for 11 years in Fla. and Mich.; for 5 to 10 years in Ariz., Ark., Colo., the Dakotas, Fla., Ga., La., Md., Mass., Mich., Minn., Mo., N. Y., Ohio, S. C., Tenn., and Va.; and for 1 to 4 years in Cal., Conn., D. C., Ind. T., Ky., Me., Miss., Mont., N. H., N. J., N. Mex., W. Va., Wis., and Wyo. In states and territories other than those named precipitation to equal or exceed 1.00 in 1 hour has not been reported for July of preceding years. Among the heavier rainfalls reported for this period in July of preceding years are: for 10 minutes, 1.30 at Huron, S. Dak., 26th, 1885; 0.67 at Dubuque, Iowa, 2d, 1889; 1.22 at Albany, N. Y., 10th, 1876; and 0.50 at New York City, 27th, 1880. For 15 minutes, 1.08 at New Market, Ala., 12th, 1889; 1.20 at Philo, Ill., 8th, 1888; 1.56 at Amana, Iowa, 31st, 1878; 1.40 at New Orleans, La., 6th, 1889; 1.00 at Saint Louis, Mo., 5th, 1848; 2.25 at Sandusky, Ohio, 11th, 1879; 1.00 at New York City, 13th, 1880. For 20 minutes, 1.90 at West Leavenworth, Kans., 21st, 1887; 2.00 at Amherst, Mass., 16th, 1879; 1.20 at Dunbarton, N. H., 27th, 1887; 1.00 at Fort McKinney, Wyo., 8th, 1888; 1.00 at New York City, 16th, 1871; 1.03 in 21 minutes, at Saint Paul, Minn., 29th, 1884. For 25 minutes, 2.40 at Indianapolis, Ind., 12th, 1876; 2.00 at Urbana, Ohio, 10th, 1879; 1.78 at Wellsborough, Pa., 16th, 1880. For 30 minutes, 3.50 at Logansport, Ind., 7th, 1879; 2.00 at Nashua, Iowa, 3d, 1882; 1.65 at Escanaba, Mich., 2d, 1872; 1.58 at Palestine, Tex., 6th, 1888. For 40 minutes, 3.49 at Jacksonville, Fla., 6th, 1886; 3.40 in 1 hour at Lansing, Mich., 21st, 1883; 5.16 in 1 hour and 30 minutes at Rock Island Arsenal, Ill., 13th, 1889; 5.10 in 1 hour and 45 minutes at Tucson, Ariz., 11th, 1878.

Table of excessive precipitation, July, 1890.

State and station.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Alabama.	*Inches.*	*Inches.*		*Inches*	*h. m.*	
Columbiana		3.80	24			
Eufaula	10.69					
Mobile		2.67	24			
Pineapple				2.00	1 05	27
Tuscumbia		2.80	24			
Valley Head		4.00	24			
Arizona.						
Ash Canyon				1.90	0 33	30
Bisbee				1.89	1 00	29
Fort Bowie				2.10	1 30	30
Mount Huachuca				2.00	1 00	30
Arkansas.						
Forrest City				1.00	1 00	14
Fort Smith				2.10	1 00	7
Connecticut.						
Fort Trumbull		2.50	17			
Hartford (2)		2.75	25			
New Haven		2.54	25			
Wallingford		2.66	25			
Florida.						
Archer	11.28	3.10	21			
Fort Barrancas	17.72	2.80 2.62 8.26	24 26 22–23			
Gainesville		2.85	22–23			
Homeland				1.30	1 30	3
Do				1.05	0 40	24
Jupiter				1.40	1 05	11
Madison	10.72					
Manatee	19.21	6.64	4			
Do		2.61	10			
Do		3.03	20–21			
Merritt's Island				1.70	1 00	27

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Florida—Continued.	*Inches.*	*Inches.*		*Inches*	*h. m.*	
Pensacola	13.68	2.63	21-22	1.71	1 00	26
Do		3.05	23			
Do		3.17	26			
Saint Francis Barracks		7.50	22-23			
Tallahassee		3.28	25			
Tampa	11.91					
Georgia.						
Atlanta		3.44	24-25			
Augusta		2.55	28			
Bainbridge	11.90					
Blakely	12.49	4.25	20			
Camak	12.67	2.90	3			
Do		3.03	25			
Do		2.76	26			
Columbus				1.25	0 30	6
Do				1.14	0 30	21
Diamond		5.30	23 to 25			
Fort Gaines		3.20	21			
Fort McPherson				1.25	1 00	7
Hephzibah				1.00	0 30	14
Louisville		2.61	20			
Marietta		2.70	24			
Milledgeville		3.01	25			
Monticello		2.97	17	2.97	2 30	17
Do				1.43	0 50	18
Perry		2.68	20			
Point Peter		2.80	24	1.10	1 00	2
Quitman (2)		4.20	7			
Savannah				1.05	1 00	8
Thomasville (2)	11.03			2.02	1 45	6
Toccoa		3.47	23-24			
Union Point		4.04	25			
Illinois.						
Beardstown		3.50	15			
Cairo				1.10	0 24	23
Charleston		5.00	31	5.00	4 15	31
Chicago				1.00	0 34	14
Louisville				2.00	1 00	14
Rushville		2.98	14-15			
Indiana.						
Marengo	10.90	7.00	23			
Princeton		3.50	23			
Vevay		2.69	23			
Iowa.						
Afton				1.10	1 00	22
Eagle Grove		3.00	12			
Glenwood		3.00	19			
Kansas.						
Englewood				1.90	1 00	27
Eureka Ranch				1.62	1 30	14
Independence		3.25	15-16			
McAllaster				1.50	0 20	3
Ogallah		2.50	3			
Quinter		2.50	14	2.50	1 10	14
Manhattan (3)		2.55	22			
Kentucky.						
Falmouth (1)		2.83	14			
Frankfort (2)		3.80	23			
Harrodsburgh				2.05	1 25	15
Shelbyville				2.00	1 15	23
South Fork		2.50	23	1.00	1 00	8
Louisiana.						
Abbeville				1.25	1 05	8
Amité City				1.01	0 20	3
Baton Rouge		2.50	24			
Cameron		2.80	27			
Cheneyville				2.40	2 10	19
Columbia		3.10	25			
Edgard				1.38	1 15	26
Jackson Barracks	11.53			1.25	0 30	15
Do				1.30	1 00	16
Luling				1.53	0 30	21
Monroe				1.55	1 20	18
New Orleans				1.00	0 30	7
Paincourtville				1.18	0 50	15
Plaquemine		3.00	23	2.20	1 00	7
Port Eads		2.57	26			
Sugar Experimental Station				1.26	1 00	7
Maine.						
Orono				1.23	1 00	8
Massachusetts.						
Amherst Experimental Station (1)		2.82	26			
Ludlow (1)		2.95	25			
Nantucket		2.57	29			
Northampton		2.85	26			
Springfield Armory		2.97	25			
Michigan.						
Benton Harbor				2.01	0 30	14
Cheboygan		6.34	7-8			
Lathrop		3.16	22-23			
Minnesota.						
Red Wing				1.18	1 00	13
Mississippi.						
Booneville		3.73	13			
Corinth		2.55	24			
Hattiesburgh	10.42	2.60	20	2.60	2 30	20
Do		3.10	24			
Do		2.85	26			
Holly Springs (2)		3.25	2			
Louisville				1.50	1 30	23
Do				1.15	1 00	24

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Mississippi—Continued.	*Inches.*	*Inches.*		*Inches*	*h. m.*	
Moss Point	10.02	3.35	22			
Pearlington	10.74	2.70	23	1.54	1 30	7
Port Gibson				1.61	0 50	31
Vicksburg				1.12	0 50	8
Missouri.						
Austin		2.75	15			
Bradleyville				2.00	2 00	9
Eldon		2.50	21			
Glasgow				1.30	1 05	8
Grand Pass				1.02	0 50	19
Ironton		3.25	23			
Jefferson Barracks				1.15	1 00	12
Kansas City				1.44	1 20	15
Lamar		2.60	20			
New Frankfort		3.00	18			
Sarcoxie				1.05	1 00	15
Nebraska.						
Ashland		3.34	19			
Fremont		3.39	19			
Kimball				1.49	0 45	19
Omaha		2.97	19			
Plattsmouth		3.97	19			
Syracuse		2.68	19			
Valentine		2.52	18-19			
Weeping Water		2.50	18-19			
Weston		2.58	19			
New Hampshire.						
Antrim		3.20	25-26			
New Jersey.						
Oceanic		3.14	28			
Rancocas				1.00	0 15	17
New Mexico.						
Fort Union				1.20	0 45	2
Fort Wingate				1.28	0 45	16
Red Cañon				1.50	0 20	31
New York.						
Boyd's Corners		3.05	25-26			
Constableville		5.91	1			
Kendall		2.50	2			
Number Four		2.85	2			
Port Jervis		2.52	3			
Turin		4.94	2			
West Point		3.60	25-26			
North Carolina.						
Bryson City		2.70	24			
Goldsborough				1.75	1.45	10
Hatteras				1.20	0 50	5
New Berne		2.96	28-29			
Raleigh	11.23					
Southport	12.05	2.75	16	1.15	1 03	29
Do		5.05	18-19			
Wilmington		2.74	29	1.30	1 00	29
North Dakota.						
Fort Pembina				1.04	0 55	10
Wahpeton		3.00	14			
Ohio.						
Cleveland				1.05	1 00	1
Columbus Barracks				1.56	1 00	24
Gratiot				1.52	0 55	1
New Comerstown		3.29	1	3.29	1 30	1
Vienna				1.25	0 20	1
Wooster				1.44	0 40	1
Pennsylvania.						
Cannonsburgh				1.04	1 00	15
West Chester				1.00	1 00	17
Wilkes Barre		3.25	15	2.50	0 30	15
South Carolina.						
Blackville		2.85	28			
Charleston	12.87	6.07	27-28	1.28	1 10	9
Hardeeville				1.07	0 30	4
Do				2.05	0 45	16
Port Royal		3.40	27-28			
Saint Georges				2.00	2 00	5
Statesburgh				1.26	0.57	19
Simpsonville		2.99	24			
South Dakota.						
Scranton				1.06	0 40	21
Yankton		2.70	19-20	2.44	2 14	20
Tennessee.						
Andersonville		2.66	24			
Arlington		5.00	13			
Bolivar (1)		2.90	13-14			
Chattanooga		2.88	23-24			
Clinton		2.85	23-24			
Dare		2.50	24	1.50	1 00	2
Fayetteville				1.07	1 00	14
Grand Junction		6.10	13-14			
Greeneville		2.65	24			
Jacksonborough		3.00	24			
Kingston (1)		2.50	23-24			
Lynnville				1.33	1 00	8
Texas.						
Edinburgh		2.81	25			
Fort Brown		2.50	26			
Merkel		3.00	4			
Waco (2)		2.50	3			
Utah.						
Losee				2.00	1 00	28
Vermont.						
Mount Killington		2.54	2-3			

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Virginia.	*Inches.*	*Inches.*		*Inches*	*h. m.*	
Cape Henry	.....	4.46	28-29	.....	.....	.....
Fall Creek Depot	11.37	.....	.....	2.04	1 25	18
Do	.....	.....	.....	2.05	1 50	24
Norfolk	.....	2.70	29	.....	.....	.....
West Virginia.						
Glenville	.....	2.64	2	.....	.....	.....
Parkersburgh	.....	.....	.....	1.45	1 00	15
Tyler Creek	.....	3.02	16	.....	.....	.....
Weston	.....	2.50	1	.....	.....	.....
Wyoming.						
Cheyenne	.....	.....	.....	1.28	1 15	4

Received too late for publication in June Review.

Illinois.						
Cockrell	.....	3.82	13-14	.....	.....	.....
New York.						
Rome	.....	2.62	14	.....	.....	.....
South Canisteo	.....	.....	.....	2.12	1 00	12
Wisconsin.						
Potosi	.....	.....	.....	1.00	0 15	3
Oregon.						
Cascade Locks	.....	3.11	18	.....	.....	.....

Reports received too late to be used in general discussion for July, 1890.

Arkansas.						
Lonoke	.....	2.50	15	.....	.....	.....
Osceola	.....	5.58	12-13	.....	.....	.....
Kentucky.						
Owenton	.....	3.30	23	.....	.....	.....
Mexico.						
Guanajuato	.....	2.80	27	.....	.....	.....
Mazatlan	.....	.....	.....	1.42	0 30	24

SNOW.

Trace of snow fell at Mount Washington, N. H., 19th, and at Calais, Me., 20th.

HAIL.

Description of the more severe hail storms of the month is given under "Local storms." Hail was reported as follows: 1st, Ohio, Oregon. 2d, Colo., Md., N. Dak., Ohio, S. Dak., Tenn., Va., Wis. 3d, Colo. 4th, Ariz. 5th, Ariz. and Minn. 6th, N. Dak. 7th, Wis. 8th, Colo., Ill., Ind., Iowa, Mass., Minn., Nebr., N. H., N. Y., Ohio, Pa., Vt., Va., Wyo. 9th, N. C., Va. 10th, Minn. 11th, Nev. 12th, Ill., N. Dak., S. Dak. 13th. Minn., N. J. 14th, Ill., Mass. 15th, Colo., Pa., Vt. 16th, Oregon, S. Dak. 17th, Colo., Ill., N. J., Ohio, Oregon, Pa. 18th, Colo., Nebr. 19th, Conn., Mass., N. Y., Vt. 20th, Mass. 21st, Colo. 22d, Colo., Minn., Nebr., N. Dak. 23d, Colo., Ind., Wis. 24th, Colo., Mass., N. Mex., Ohio, Oregon. 25th, Mass., Minn., N. Mex., Pa. 26th, Mass. 27th, Ariz., Kans. 28th, Ariz., Colo., Minn., Utah. 29th, Ariz., Kans., Minn. 30th, Ariz., Nev., N. Dak. 31st, Colo., N. H., N. Dak.

SLEET.

Sleet was reported at Huron, S. Dak., 2d, and at Mount Washington, N. H., 20th.

MAXIMUM RAINFALLS IN ONE HOUR OR LESS.

The following table is a record of the heaviest rainfalls during July, 1890, for periods of five and ten minutes and one hour, as reported by regular stations of the Signal Service furnished with self-registering gauges:

Station.	Maximum fall in—					
	5 min.	Date.	10 min.	Date.	1 hour.	Date.
	Inch.		*Inch.*		*Inch.*	
Bismarck, N. Dak.	0.06	7	0.12	7	0.65	7
Boston, Mass	0.15	26	0.28	26	0.85	26
Buffalo, N. Y.	0.18	17	0.25	17	0.25	17
Cincinnati, Ohio	0.10	23	0.12	23	0.26	23
Chicago, Ill	c.40	14	0.56	14	1.04	14
Cleveland, Ohio	0.20	1	0.35	1	1.05	1
Denver, Colo	0.03	22	0.07	22	0.26	22
Detroit, Mich.	0.25	1	0.45	1	0.70	1
Duluth, Minn	0.25	30	0.38	30	0.85	30
Dodge City, Kans	*	.....	*	.....	0.10	8
Galveston, Tex	0.15	24	0.25	24	0.55	24
Jupiter, Fla	0.43	21	0.65	21	1.30	11
Marquette, Mich	0.30	7	0.45	7	0.75	22
Memphis, Tenn	0.10	17	0.18	17	0.35	17
New York City	0.12	25	0.18	25	0.54	3
New Orleans, La	0.25	7	0.32	16	1.00	7
Norfolk, Va	0.25	18	0.50	18	0.82	28
Omaha, Nebr	.....	.....	.....	.....	.....	.....
Philadelphia, Pa	0.13	26	0.24	26	0.56	26
Portland, Oregon	0.03	8	0.05	8	0.10	8
Savannah, Ga	0.40	8	0.70	8	1.05	8
San Diego, Cal	†	.....	†	.....	†	.....
San Francisco, Cal	*	.....	*	.....	*	.....
Santa Fé, N. Mex	0.10	1	0.15	1	0.45	19
Saint Louis, Mo	*	.....	*	.....	0.14	12
Saint Paul, Minn	0.12	25	0.15	25	0.25	25
Washington City	0.30	2	0.57	2	0.88	2
Wilmington, N. C.	0.20	18	0.35	18	1.30	29

*Not sufficient to register. †No rain.

WINDS.

The prevailing winds during July, 1890, are shown on chart ii by arrows flying with the wind. In New England and the middle and south Atlantic states the winds were mostly from south to west; over the Florida Peninsula, easterly; in the west Gulf states, the Rio Grande Valley, the Missouri Valley, and on the southeast slope of the Rocky Mountains, south to southeast; in the Ohio Valley and Tennessee, south to southwest; in the lower lake region and over the northern plateau region, southeast to southwest; in the extreme northwest, southeast; on the northeast slope of the Rocky Mountains, over the middle plateau region, and on the middle and south Pacific coasts, southwest to northwest; on the middle-eastern slope of the Rocky Mountains and over the southern plateau region, southerly; on the north Pacific coast, north to west; and in the east Gulf states, the upper lake region, and the upper Mississippi valley, variable.

HIGH WINDS (in miles per hour).

Wind velocities of 50 miles, or more, per hour were reported at regular stations of the Signal Service as follows: 4th, 52, ne., at Chicago, Ill. 7th, 75, nw., at Moorhead, Minn. 9th, 75, nw., at Mount Killington, Vt. 31st, 80, w., at Mount Washington, N. H.

LOCAL STORMS.

On the afternoon and evening of the 1st heavy rain and thunder-storms, attended in places by hail, occurred in various sections of Ohio, causing great damage to property and crops by flooding streams, etc. On the 2d a severe thunder-storm, with heavy rain, prevailed in northeast New Jersey; the operation of electric wires was interrupted, and a number of buildings in Paterson were struck by lightning. A cloud-burst in the mountains washed out the tracks of the Texas Pacific Railroad in El Paso Co., Tex., on the 3d. A heavy gale prevailed over Lake Michigan the night of the 3d and during the 4th, causing some damage to shipping. On the 4th a heavy rain storm occurred at and near Milford, N. J., in the afternoon, flooding small streams, drowning one child, and causing loss to live stock, buildings, and crops to the extent of about $100,000. A report from Parkersburgh, W. Va., dated the 5th, stated that heavy rain had caused immense damage in that section, and the loss by flood in the Muskingum Valley, Ohio, was estimated at $500,000. On the 5th a heavy thunder-storm, without rain, passed over Spartanburgh, S. C.; at Campobella, S. C., rain fell heavily, badly washing lands and carrying away dams in that section. On the 7th one of the most terrific thunder-storms in the history of that